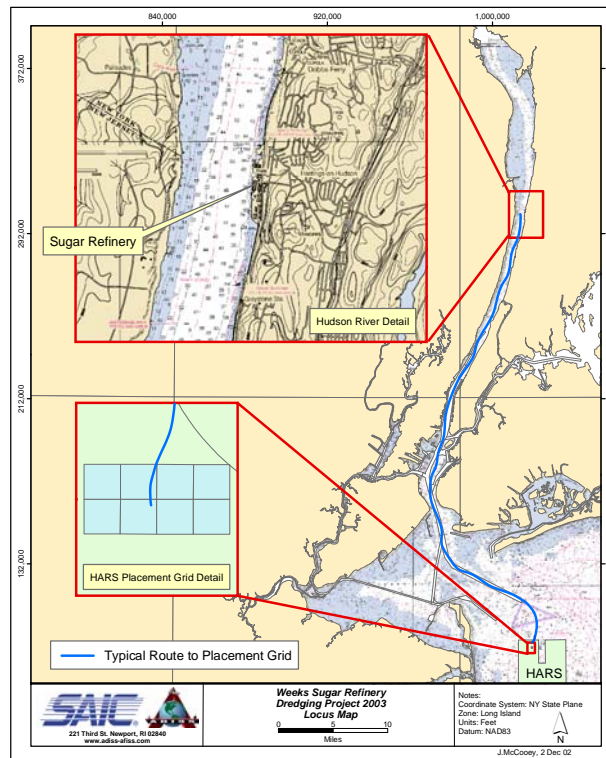


# MONITORING DREDGED MATERIAL PLACEMENT OPERATIONS AT THE HISTORIC AREA REMEDiation SITE DURING THE REFINED SUGAR PROJECT, October 2003



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## 1.0 OBJECTIVES

During the Refined Sugar project, SAIC provided Automated Disposal Surveillance System (ADISS) technical support services under separate contracts to the permittee, American Refined Sugar, Inc., and to the monitoring agency, U.S. Army Corps of Engineers, New York District (NYD). ADISS was employed to monitor the placement of dredged material at the Historic Area Remediation Site (HARS; [Figure 1]). Under contract to American Refined Sugar, SAIC provided the equipment, software and technical expertise to maintain the systems and process the data. For NYD the objectives were to:

- Provide real-time placement and draft information, including load misplacement and scow leakage alarms;
- Acquire, process and submit information concerning potential misplaced material events;
- Post the Inspector logs and Transportation Planning List (TPL) on the web site;
- Provide the placement grid used on the ADISSPlay vessel guidance system.

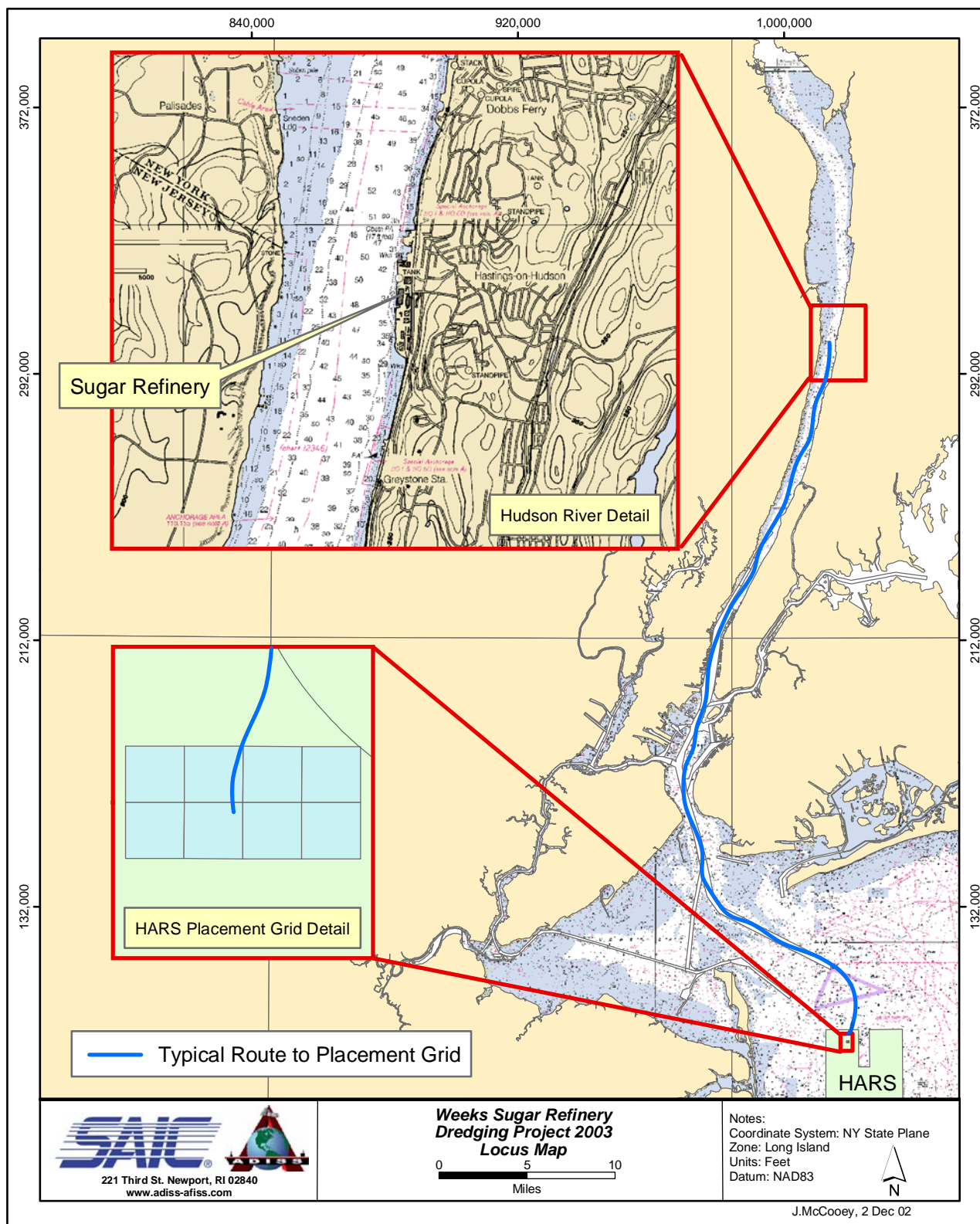
SAIC provided monitoring services to American Refined Sugar and NYD for the previous Refined Sugar projects during the previous five years (SAIC 1999, 2001a, 2001b and 2002a). Initial development of ADISS during the 1997 Capping Project preceded introduction of ADISSPlay, the helmsman display and vessel guidance system. The present ADISS/ADISSPlay monitoring system was managed by SAIC for NYD placing dredged material within the HARS, and the installation and maintenance of the system on the dredge scows and tugboats owned and operated by Weeks Marine, Inc. occurred under separate contract with American Refined Sugar.

In addition to hardware installation and maintenance, services included the daily monitoring of data transmitted via cellular telephone from the tugboats. The transmitted ADISS information was processed and made available to NYD via the ADISS web site, hosted at the SAIC Newport, RI facility. As ADISS data were received, they were processed for placement locations at the HARS grid and entered into the ADISSWeb (Internet Map Server) database. NYD personnel accessed the ADISSWeb plots posted on the web site, <http://www.adiss-afiss.com/>. Plots and copies of the Inspector logs and TPL checklists were also provided to NYD for analysis.

The objectives of this project were based upon previous project experiences and American Refined Sugar and NYD needs. The requirement for daily monitoring was met by posting telemetered ADISS data on the Internet using ADISSWeb.

The position and draft data acquired from the ADISS installations were also provided on the Internet at <http://www.adiss-afiss.com/> for public outreach.

SAIC programmed the placement grid for the Refined Sugar project shown in Figure 1 on the ADISSPlay system for placement guidance. The NYD provided the grid coordinates and dimensions to SAIC for this purpose.



**Figure 1.** Refined Sugar placement at the Historic Area Remediation Site.

## **2.0 SYSTEM DESCRIPTION**

ADISS was composed of a DGPS positioning (Wide Area Augmentation System [WAAS] enabled), draft recording unit and a spread-spectrum transceiver for data telemetry from the scow to the towboat. Aboard the boat, ADISSPlay consisted of a helmsman display, telemetry, and an Inspector database program. The combined ADISS/ADISSPlay system was adapted for monitoring placement operations at the HARS from previous experience at other disposal areas. ADISS/ADISSPlay data containing completed trips were telemetered via cell phone from the tugs to the SAIC Newport facility for processing and analysis. Processed data were posted on ADISSWeb for viewing by both NYD and American Refined Sugar.

Prior to the Refined Sugar project, an alternative method of tracking scow transits and dredged material placements at the HARS was instituted (SAIC 2002b). In the event that communications failed with the ADISS unit installed on the scow, the inspector would be able to switch to an alternate that estimated the scow position from the tugboat GPS unit and the layback distance to the towed scow. The alternative program, ADISSLt, could be used to track the scow until the problem was solved before the next transit took place. In addition to utilizing the ADISSLt program, the inspector was instructed to notify SAIC of the problem, so corrective action could be taken in a timely manner.

A description of the ADISS system was available in the report of the prototype system (SAIC 1998a), and the ADISSPlay system, including the Inspector log function was described in a letter report (SAIC 1998b). Both systems have undergone extensive changes with advances in technology to increase the reliability of recording and transmitting data. Since the previous Refined Sugar project, a second version of ADISS (V-2) was developed, which utilized a more reliable DGPS receiver and stored the data with less power. The new DGPS receiver was the Garmin Model 16 DGPS (WAAS-enabled). DGPS position and pressure data were recorded with a Persistor CF-1 PCMCIA recorder. Data were transmitted to the tugboat with spread-spectrum, frequency hopping Freewave radio modems. Power for ADISS was provided with an internal 12 amp-hour battery recharged by a 10-watt solar panel, allowing ADISS to operate automatically to record the transit and placement locations at the HARS.

The ADISSPlay system was modified to include the TPL checklist of items necessary for the successful shipping of each scow load to the HARS. Exceptions to the list were noted by the inspector at different phases of each transit, and a record was transmitted to ADISSWeb for display at the end of each placement.

The method of transmitting the data from the tugs to SAIC was also modified to enhance the reliability and timeliness of sending the ADISS, Inspector log and TPL information. All data was sent in '.txt' format by FTP with a simple graphic user interface to show the inspector the information had been sent successfully. Along with the ADISSPlay data, the interface also transmitted the time of the logged entries and transmission activities, creating a document trail for further analysis by NYD.

The new transmission method eliminated the use of PC Anywhere™, and resulted in quicker reporting. All trip data were submitted within 60 minutes of each placement, which resulted in automatically posting the data on the Internet within 2 hours. The inspector for the project endorsed the revised method of data transmittal. Previous trip reporting had been sporadic, because PC Anywhere™ did not display transmission failures. Consequently, the inspectors were unaware the data had not been sent for multiple trips, and reporting was delayed.

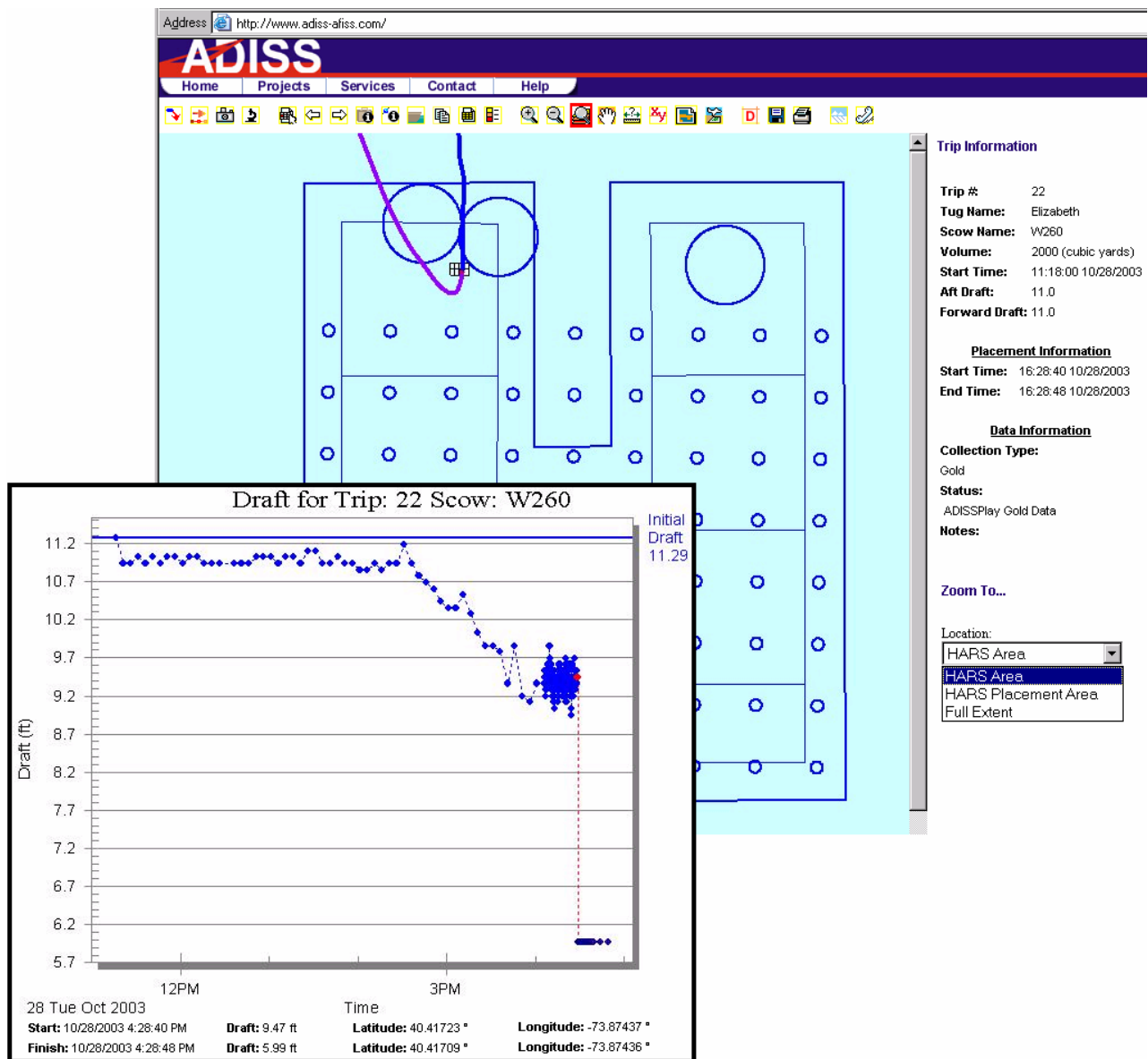
Another ADISSPlay modification to provide the helmsman with the correct trip number was tested and instituted during the Refined Sugar project. The method, suggested in the previous Passenger Ship Terminal report (SAIC 2003), included the transmittal of trip number assigned by a computer located at the SAIC Newport facility to the tug at the beginning of each trip. This change eliminated potential confusion as to trip sequence, and would have increased importance on projects with multiple tugs, where inspectors have irregular watches and poor communication.

The helmsman was also provided with a display of target cell eligibility information transmitted from the central computer at the beginning of each trip to the HARS. ADISSPlay displayed cell eligibility by color-code: Red, yellow and green cells were not available, limited, and completely available, respectively. To operate the new ADISSPlay feature, the helmsman and inspector selected the target cell for the trip based on prevailing sea and weather conditions. The selected cell and shape-up lanes were highlighted on the display to guide the approach of the towboat and scow. After each placement, the ADISS/ADISSPlay position and draft data was transmitted to SAIC, and the central computer database for cell eligibility was updated.

During the Refined Sugar project, the Internet display of placement events was maintained to monitor daily disposal activities without visiting the installations to retrieve the stored data for each event. The cellular telephone data transmissions received from ADISSPlay were automatically plotted and posted on the ADISS web site using ADISSWeb. Figure 2 shows the ADISSWeb display of data available at <http://www.adiss-afiss.com/>.

The purpose of remote reporting was to provide NYD with a means of detecting leaking scows and potential misplacements outside the permitted area quickly without deploying technical personnel to recover the data. Automated subroutines checked the incoming data, and broadcast e-mail alarms if they exceeded the pre-set thresholds for placement or leakage. E-mail warnings consisted of a notification of trip number, date and time. NYD personnel could then query the ADISS web site for misplacement times and positions, as well as plots of position and vessel draft during transit. The automatically processed data were unconfirmed until checked for accuracy by SAIC. Unconfirmed data, automatically posted on the web site prior to the QA checks were labeled as preliminary data. The label was removed from the display once the data were checked for accuracy. By monitoring the Internet, leaking scows and misplacements could be confirmed by NYD in a timely manner, and a solution could be reached with the dredging contractor.

After the completion of the project, SAIC produced plots of the transit and draft data, which were posted on the web site for public outreach. In addition to the graphics, access to this report was made available to the public on the ADISS web site in '.pdf' format.



**Figure 2.** ADISS position and draft information displayed for viewing on ADISSWeb. (Note the steady decrease in scow draft over time demonstrates a typical leaking event.)



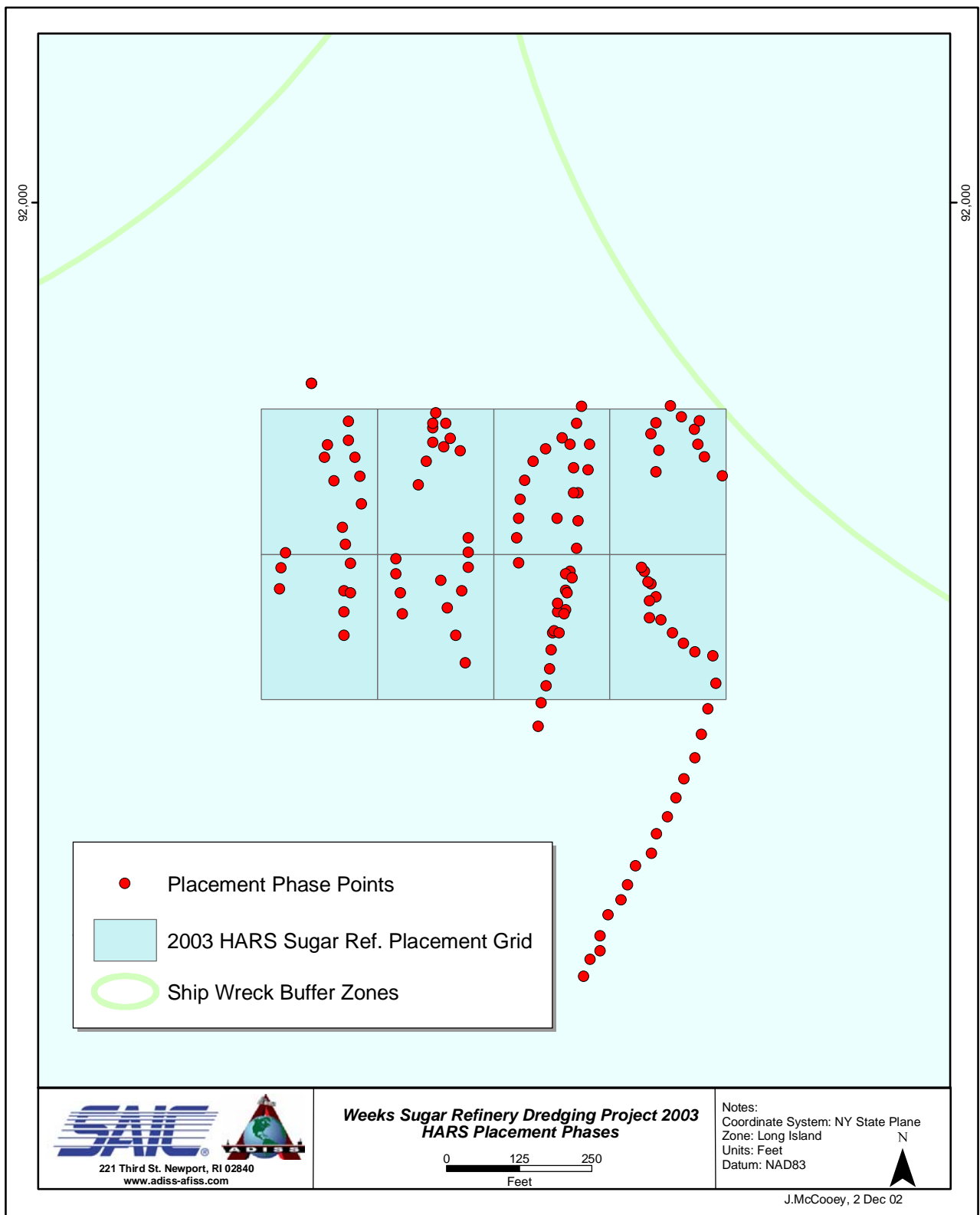
### 3.0 FIELD SERVICES AND DATA PROCESSING

The Refined Sugar project began on October 17, 2003, when Weeks Marine shipped the first load of maintenance dredge material to the HARS. ADISS units were installed aboard scows W-260 and W-261. ADISSPlay units were installed aboard the tug *Elizabeth* over the course of the twelve-day project, which ended October 29, 2003.

ADISS/ADISSPlay successfully monitored 96% of all 24 placements. Trip #1 was not recorded with ADISSPlay, because most of the material had escaped through a leak (W-261), tripping the threshold for placement prematurely. The inspector placed the system in the ADISSLt mode, when the leak occurred to record the placement of the remainder of the material. The alternate program estimated the scow position from the tug GPS and the layback distance to the scow. Without draft information, ADISSLt depended on input from the inspector to mark a placement event. Once the scow communications were restored by SAIC engineers through the cellular link, ADISSPlay was reset to its default values, and the scows were tracked directly from ADISS signals.

During previous projects at the Refined Sugar location, all 11 trips were recorded during the October 2001 project, and nine out of ten trips were recorded during the 2002 project (SAIC, 2001b).

Plots of each placement and draft record are available on the ADISS web site <http://www.adiss-afiss.com/>, and can be accessed by choosing a trip number. For the present project, all show the accurate placement within the designated target grid, except for trip #24, which occurred south of the last cell in the grid series. Figure 3 is a summary plot of all 24 recorded trips. The maintenance material dredged from the Refined Sugar project contained significant volumes of water, decreasing the disposal time over the target cells to seconds instead of minutes.



**Figure 3.** Summary of 24 placements at the Historic Area Remediation Site, Priority Area #1 during the Refined Sugar project, October 2003.

## **4.0 SUMMARY AND RECOMMENDATIONS**

The following summarizes the results of monitoring the placement operations at the HARS during the Refined Sugar project:

- ADISS units aboard two scows recorded 96% of all 24 placements, and ADISSPlay also recorded 96% of all transits to the HARS.
- The ADISS/ADISSPlay-telemetered data provided near real-time updates on the Internet of daily placement activities to NYD using the ADISSWeb program, and the newly instituted means of data transfer utilizing text files and a graphic user interface.
- Transmitted the Inspector log information along with the TPL checklist information and the ADISS data for Internet display, and recorded and telemetered the times of inspector logging activities for NYD analysis.
- Provided trip numbers from a central computer located at the SAIC Newport facility utilizing two-way cellular communication with the ADISSPlay program installed aboard the towboat.
- Transmitted and displayed target cell eligibility information to the ADISSPlay helmsman display, allowing the operator to select targets and shape-up lanes for each placement according to sea and weather conditions.

The following recommendations are suggested to improve HARS management operations:

- Develop the capability to transmit scow leakage and misplacement data via the Low Earth Orbiting (LEO) satellite system.
- Create an interface within ADISSWeb to allow adjustments of target cell eligibility.
- Provide a summary of TPL exceptions on ADISSWeb with a query select feature.
- Modify the ADISSWeb display of draft to include scow velocity to analyze scow leakage events.

## 5.0 REFERENCES

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